

INDEX

- abstract, 22, 154–62, 175, 195
- academic world, xxi, 150, 153
- administration, 40, 43, 47, 57, 58, 95, 117, 139, 142, 158, 165, 167, 188
- Airbus A380, 133
- algorithm, 58, 66, 87, 94, 98, 102, 122, 192
- alternatives, 6, 8, 12, 26, 39, 42, 53, 54, 66, 105, 115, 157, 166, 170, 195
- analysis, ix, 6, 7, 53, 59, 73, 75–7, 100, 108, 131, 156, 170, 179, 185, 188–90, 196, 199
- analytic, 6, 21, 87, 88, 127, 129, 143, 174, 192, 195
- Antarctica, 71, 72, 74–6
- application, xv, 20, 23, 24, 26, 47, 114, 115, 145, 148, 150, 151, 157, 164, 166, 167, 181, 192, 193
- architect, xx, 85, 123, 142, 152, 195
- audacity, 12, 77
- Booz Allen & Hamilton, 86, 88
- bottlenecks, 109–17
- bottom up, 94, 117
- boundaries, xii, 7, 9, 30, 72, 82, 106, 131, 166, 171–9
- broad perspective, 13, 21, 39, 117, 126, 129, 146–8, 153, 162, 183
- Build to Need, 84
- Build to Print, 84
- Build to Spec, 84
- business, 10, 21, 22, 25–7, 55, 60, 89, 94, 95, 101, 105, 108, 111, 114–16, 124–30, 139, 147, 148, 158, 165, 176, 177, 187, 193, 194, 196
- business sector, 26
- Capability Maturity Model Integration (CMMI), 158
- centralist, 41
- chances, 10, 30, 31, 38, 60, 61, 82, 97, 99, 100, 105, 108, 118, 128, 129, 166
- checks and balances, 64–6
- chief systems engineer, xi, 17, 22, 23, 42, 45, 52, 55, 58, 95, 99–102, 104, 117, 141, 142, 146–47, 155–8, 190
- classical engineering, xix, 14, 22, 161

- closed systems, 106
 coach, 196, 200, 201
 code, 22, 86, 151, 152, 161, 174, 196
 commercial and industrial world, xxi, 125
 commercial and marketing considerations, xx
 complex civil systems, xxi, 110–136
 complex systems, 3, 4, 10, 25–7, 30, 66, 79, 91, 103–5, 108, 112, 113, 116, 117, 121, 145, 146, 153, 154, 160, 174, 176, 177, 183, 186, 191
 complex technological projects, xx, 17, 130
 computer, 20, 31, 43, 50, 57, 86, 98, 100, 136, 137, 143, 146, 150–154, 159–61, 164, 180, 182, 183, 186, 196
 computer engineer, xix, 20, 150, 160
 computing worlds, xxi, 137–62
 Concorde, 133
 concurrent engineering, 193
 configuration, 37, 38, 40, 44, 49, 57, 58, 65
 conflict of interests, 65
 connections, xvii, 10, 22, 30, 59, 73, 87, 88, 98, 105, 131, 137, 153, 160, 166, 171–3, 179, 181, 187
 constraints, xvii, xix, xx, 4, 5, 8, 12, 16, 26, 29, 30, 36, 38, 40, 41, 44, 45, 63, 82, 85, 97, 98, 100, 113, 126, 129, 130, 135, 147, 148, 155, 158, 164
 consulting, xxi, xxv, 41, 59, 74, 86, 88, 185–201
 control systems, 3, 9, 12, 48, 57, 113, 123, 151, 160, 165, 166, 180, 185, 186, 192, 194
 core engineering, 188
 cost-plus pricing strategy, 4
 craftsman, 93
 creativity, 46, 79, 84, 124, 184
 critical thinking, 89, 93
 curiosity, 12, 87, 90, 92, 95, 123, 129, 168–71
 deadline, 4, 5, 23, 41, 100, 170, 181, 196, 200, 201
 decision making, 54, 170
 defense industry, xiii, 25–7, 108, 110, 111, 113, 117, 140, 191
 design, 4, 6, 7, 9, 10, 20, 22, 26, 36, 37, 39, 45, 57, 58, 61–64, 66, 75, 77, 93, 94, 103, 105–8, 112, 119, 121, 123, 127, 133, 141, 143, 144, 150, 151, 153–5, 158, 159, 165, 167, 171, 173–6, 186, 191–7, 199–201
 design review, 107, 119, 144
 design-to-cost, 61
 detailed planning, 46, 48
 development, xv, xix, xxi, xxiv, 3, 4, 6, 8–10, 15, 16, 19–22, 25–8, 30, 31, 36–9, 43–6, 50, 52–67, 71, 136–8, 140, 141, 143, 147–53, 155, 159–61, 163, 166, 170, 171, 173, 174, 180, 186, 189, 192–7
 development manager, 21, 126
 directorate, 39, 40, 42, 55, 57, 58, 60, 94, 95, 139, 157–9
 disciplinary systems engineer, 20, 59, 96–8, 101, 107
 discipline, xiii, xv, xix, xx, 3, 5, 14, 22, 26, 28, 30, 59, 60, 77, 80–86, 91, 93, 102, 103, 106, 107, 119, 123, 127–31, 136, 137, 139–41, 144–50, 153–8, 160–162, 166, 168, 169, 172, 174, 175, 177, 178, 180, 181, 183–5, 187–90, 192, 193
 domain, 92, 142, 179
 early planning, 4
 economic constraint, xx
 egoless, 16, 56, 60
 Elbit systems, xxiii, xxv, 27, 80, 122, 127, 143, 144, 147, 148, 193
 electronic engineer, xix, 3, 6, 7, 19–21, 24, 58, 80, 82, 86, 87, 93, 103, 122, 129, 139, 142, 155, 159–61, 163, 182, 187, 196
 emergence, xx, 4, 29, 84, 105, 152
 engineering analysis, xix, xx, 73
 engineering teams, 8, 94, 121, 186
 entrepreneur, 96, 150, 191
 evaluation, 38, 89, 91, 156, 170
 evolution, xv, xx, 4, 19–24, 30, 45, 49, 84, 101, 136, 141, 143, 147, 155, 163, 174, 179, 185, 194, 195
 feasibility study, 36–9
 financial component, 4
 fix price strategy, 54
 flexibility, 5, 48, 82, 148

- Full Scale Development (FSD), 96, 97
functional, 49, 93, 128, 166, 193
- generalist, 177
globalization, xix, 11
graduate program, xix, 24, 179
- hardware, 23, 77, 98, 102, 122, 123, 129,
146, 150–152, 159, 190, 196
hierarchy, 13, 88, 98, 104, 106, 122, 169
high risk, 95
holistic, xv, 4, 121, 123, 131, 143, 195
holistic thinking, 30, 163–8
human engineering, 84
human errors, 30, 31
human factors, xx, 11, 16, 30, 91, 108, 153,
175, 198
human perspective, 87
human systems, 4, 90, 103
hybrid simulation, 98
- IAI- Israel Aircraft Industries, xx, xxiv, 22,
35–51, 83, 98, 147, 181, 182
IBM, 28, 137, 140, 141, 150
IBM R&D Lab, 138, 139
Indigo, xxiv, 26, 112, 125–9
infrastructure, 16, 111, 126, 133–5, 153,
155, 159, 187, 195
integration, xii, xix, 3, 4, 6, 7, 11, 12, 22, 27,
39, 43, 58, 96–100, 102, 106, 108, 117,
122, 123, 128–31, 138, 154, 155,
158–61, 183, 192, 193, 195
integrator, 15, 51, 109
intercultural, 108, 109, 191
interdisciplinary, xi, xii, 7, 11–13, 31, 59,
85, 107, 136, 171, 180
interface, 107, 118, 122, 127, 135, 136, 150,
155, 159, 178, 195, 197, 199
internet, 10, 31, 73, 85, 89, 105, 174
interpersonal, 15, 16, 30, 90, 122, 149, 169,
177
interpersonal skills, 15, 30, 149, 169, 177
intuition, 66, 79, 93, 132, 199
Iron Dome project, xx, 7, 9, 16, 52–67, 184
IT, 28, 140, 141
- job description, 82, 104, 143, 144, 164
- lateral, 6, 7, 14, 20, 49, 59, 71–9, 98, 133,
146, 157, 160
- lateral systems engineering, 7, 59
Lavi project, xx, xxiv, 4, 35–51, 54, 80, 81,
83, 84
leadership, xiii, 13, 21, 30, 50, 59, 78, 79,
91, 94, 117, 127, 149, 159, 183, 188
leadership skills, xix, 13, 15, 16, 94, 127,
186, 188
learning ability, 12, 48, 144, 147
life cycle, 45, 107, 125, 152, 171, 180, 195
lifespan, 173
lifetime of a project, 30
Lockheed Martin, xvi, xxiii, 72, 78, 140,
156, 194
long lived, 174
low risk, 95
- management, xiii, xiv, xv, xvi, xvii, xix, xx,
xxv, 4, 5, 8, 10, 13–18, 22, 30, 31,
36–8, 40–43, 48, 49, 51, 52, 55, 56, 59,
61, 62, 76–80, 83, 89, 90, 92, 96, 97,
99–102, 104, 106, 108, 110–112, 116,
118–20, 125, 126, 129, 132, 139–41,
143, 153, 156–8, 160, 162, 166–8,
170, 171, 178, 180, 185–91, 193
management oriented systems engineering,
7, 20, 21, 124–30
managerial systems, xvii, xix
matrix, 21, 26, 40, 73, 83, 127, 128, 192
mechanical engineer, xix, 80, 103, 125,
129–31, 136, 146, 152, 172, 178, 180,
182, 187, 190, 195
mega-systems, 10, 103–9
methodicalness, 13, 46, 49
methodology, 4, 46, 48, 77, 93, 120, 122,
131, 137, 148, 155, 180
missile, 48, 52–9, 61, 62, 64–6, 77, 94–8,
100, 101, 111–13, 158, 160, 191, 192
Model Based Systems Development
(MBSD), 194, 195
Model Based Systems Engineering (MBSE),
xxiii, 191–6
models, 8–10, 15, 22, 31, 35, 36, 41, 57,
66–7, 77, 88, 91, 105, 106, 133, 140,
156, 158, 160, 168–70, 175, 184, 194,
199
multidisciplinary, xi, xii, 9–13, 21, 53,
71–80, 90, 102, 104, 110, 127, 131,
143, 180, 181
multidisciplinary skills, 3

- multidisciplinary team, 11, 30
- multidisciplinary view, 6
- Myers and Briggs model, 88, 91
- needs of the client, xvi, 6, 8, 25, 107, 115, 148, 180
- non-engineering systems, 76
- open systems, 106
- openness, 12, 180
- operational needs, 53, 94, 95
- operations research, 131, 136
- opportunities, ix, xiv, xvi, xvii, 10, 105, 116, 140, 169, 192, 194, 195, 199, 200
- optimization, 10, 26, 115, 130–136, 181
- organizational structure, 10, 55, 59, 96, 97, 100, 127
- organizational systems, 11, 43, 59
- patterns, xx, 5, 6, 9, 14, 16, 17, 20, 25, 27, 43, 46, 59, 61, 63, 64, 72, 79, 84, 86, 88, 97, 107, 108, 120, 129, 134, 139, 152, 154, 158, 164, 172, 176, 181, 189, 191
- people-oriented, 15, 41
- performances requirements, 35, 53, 56, 57, 100, 155
- pharmaceutical industry, xxiv, 10, 110, 114–15
- phase, 10, 27, 31, 39, 46, 47, 57, 58, 63, 95–100, 102, 105, 107, 121, 122, 125, 171, 190, 194, 201
- Philips Medical Systems, xxiii, 118–21
- Plan-Do-Check-Act cycle, 199
- planning, 4, 5, 7, 10, 26, 30, 36, 39, 40, 44–6, 48, 50, 57, 58, 66, 74, 79–85, 93, 98, 100, 102, 105, 106, 116, 121, 122, 124, 130, 133, 134, 141, 145, 156–8, 160, 177, 181, 192, 193, 197, 199, 201
- political aspect, 37–9
- position, xii, xiv, 4, 14, 17, 19–21, 26, 27, 30, 36, 42, 43, 45, 49, 56, 60–62, 71, 73, 79–83, 85, 88, 91, 97, 99, 101, 103, 104, 110–112, 114, 118, 119, 121, 122, 124–7, 131, 138–40, 142, 143, 146–8, 156–9, 161, 162, 170–172, 178, 186, 187, 194
- preliminary planning, 36, 39, 40, 44, 46, 48
- priorities, 17, 63, 190
- problem formulation, 170
- problem solving, 12, 13, 77, 92, 100–101, 163, 166, 167, 169
- process oriented, 13, 50, 107
- production, xx, 10, 26, 27, 35, 36, 44, 63–5, 81, 91, 113–16, 132, 139, 180, 193
- profession, 5, 14, 19, 20, 23, 28, 49, 82, 104, 107, 117, 125–7, 137, 139–42, 154, 158, 163, 166, 169, 171, 174, 177, 179–85, 190
- professional/disciplinary systems engineer, 20
- professional engineers, xix, 15, 139
- program manager, 85, 128, 147, 148, 172
- programmatic, 93
- project management, 17–18, 22, 48, 56, 83, 97, 156–8, 162, 170, 186, 188, 190
- prospect, 139
- prototype, 49, 58, 192
- public sector, 25, 176
- qualitative study, xv, xx
- quality, xv, 4, 9, 48, 49, 54, 60, 66, 73, 79, 89, 92, 93, 102, 105, 114, 189, 197, 199, 200
- Rafael Advanced Defense Systems Ltd., xxiii, xxiv, xxv
- Reliability, xv, 25, 94, 111, 141
- requirements management, 180
- requirements specifications, 26, 97, 177, 189
- research station, 71, 72, 74
- retrospect, 56, 114, 125, 201
- reverse engineering, 36
- risk(s), 96
- risk assessment, 95
- risk reduction, 94–6
- risks management, 10, 116, 160, 166
- robustness, 132, 133
- schedule, xiii, 17, 25, 41, 45, 49, 53, 56–8, 60, 63, 78, 95, 100–102, 113, 116, 123, 129, 141, 147, 170, 187, 188, 190, 192, 196–201
- scope, 4, 7, 22, 40, 42, 43, 103, 105, 132, 141, 148, 195
- Senior Technology Engineer, 21
- short lived, 173, 174
- simplicity, 132, 133
- simplification, 8, 30, 94–102, 183
- simulations, 31, 66, 98, 190

- socio-technical, 90, 105–8
- software, xx, 3, 4, 7, 19, 20, 22, 23, 42, 50, 58, 59, 77, 98, 100–103, 106, 107, 122, 123, 125, 128–30, 136, 138–48, 150, 152, 154–6, 159–61, 165, 177, 178, 182, 183, 186, 187, 189–91, 195–7
- software engineer, 20, 22–4, 58, 129, 143–6, 155, 159–61, 182, 183, 190, 195, 196
- software engineering, xxiv, 3, 22, 155, 156, 159–61, 177, 178, 187, 189
- South Pole, xiii, 71–3, 75
- space industry, 25
- specialist, 3, 22, 30, 36, 43, 63, 64, 98, 102, 138, 145, 150, 151, 155, 157–61, 164, 177, 178, 184, 189
- specialization, 3, 7, 17–19, 43, 75, 82, 114, 116, 129, 131, 145, 147, 157, 170, 178, 180, 183, 190
- stakeholders, 12, 173, 187, 194, 195
- strategic planning, 116
- strategy, xxiv, 4, 54, 116, 132, 134, 140, 181, 193
- super-systems, 83, 102, 103, 105, 106
- synthesis, 6, 7, 76, 174, 179
- synthetic, 7, 174
- system architecture, 39, 50, 141
- system design review - SDR, 39
- System Modeling Language (SysML), 161
- system reliability, 25
- system requirements, 54, 97, 180, 194
- system safety, xv, 25
- system science, 105, 175
- system, systems, 164
- systematic thinking, 9, 87, 93, 162–67, 175, 190
- systematism, 5
- systemic, xv, xvii, xix, 3, 13, 21, 25–7, 30, 39, 42, 58, 61, 64–6, 75, 79–81, 90, 102, 105–8, 112–20, 123, 125, 126, 128, 129, 131, 135, 138, 143, 149, 151, 153, 156–8, 160, 167, 183
- systemic view, 8–13, 26, 125
- systemists, 107
- system's boundaries, 9, 173
- systems engineering, xi, xii, xiii, xiv, xv, xvi, xvii, xix, xx, xxi, xxiii, xxiv, xxv, 3–31, 38, 39, 41–3, 45, 46, 48–50, 52, 59, 65, 67, 72, 73, 75–9, 82–6, 88, 92, 94, 97, 98, 101–4, 106–8, 110, 114–27, 129–31, 135–63, 163–201
- systems of systems, 10–11, 23, 146
- systems science, 105, 175
- systems thinking, xii, xxiv, 5, 12, 81, 83, 106, 110–112, 116, 123, 135, 156, 158, 184, 196
- T model, 6
- target function, 11, 132
- task-oriented, 15, 41
- teamwork, 15, 50, 62, 142, 182, 188, 195
- technical manager(s), xxiii, 17, 27, 82, 142, 147, 148, 190
- technical systems engineering, 7
- technological systems, xvii, xix, 4, 7–9, 11, 22, 43, 67, 89, 90, 103, 110, 117, 130, 135, 149, 160, 173, 177, 181, 194, 198
- test and evaluation, 156
- testing, 6, 31, 46, 47, 49, 57, 58, 64, 66, 80, 98, 100, 121–3, 148, 161, 165, 192
- Thales, xxv, 104, 109
- top down, 13, 94, 117
- trade-offs, 12, 26, 38, 50, 64, 66, 76, 77, 123
- training, ix, xxi, 5, 6, 8, 16, 19, 20, 23, 24, 29, 45, 77, 79, 83, 84, 88, 93, 100, 118, 119, 129, 138, 144, 156, 161–5, 167, 171, 172, 177, 179–82, 184–201
- training and consulting world, xxi, 185–201
- Trans-Israel Highway, 133
- transportation, xxv, 10, 29, 75, 105, 130, 134, 135, 140, 173, 176
- uncertainty, 4, 36, 132, 149
- uncertainty levels, 4
- Unified Modeling Language (UML), 161
- United States, xii, xxiii, 10, 45, 71, 72, 74, 75, 90, 95, 107, 108, 119, 121, 150, 168, 172, 173, 181, 187, 191
- usability, 62
- usage failure, 31
- V model, 31, 184
- validation, 31, 128
- virtual, xii, 121, 153, 155
- virtual models, 22, 160
- zoom in, 117, 136
- zoom out, 117, 136, 172